

In Memoriam Adelina Georgescu

THE FLOW OF A PARTICULAR CLASS OF OLDROYD-B FLUIDS*

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Abstract

This paper deals with Taylor-Couette flow formation in a particular class of Oldroyd-B fluids filling the annular region between two infinitely long coaxial circular cylinders, due to a time-dependent axial shear applied on the outer surface of the inner cylinder. The obtained solution is presented as the sum of a related Newtonian solution and the specific non-Newtonian contribution. Afterwards, it was specialized to give the solution for second grade fluids and Maxwell fluids, as well. Some exact solutions for particular classes of Oldroyd-B fluids arise as limiting cases of our solution. These results were established as limiting cases of the solution of an initial-boundary problem in fractional derivatives which was obtained, in its turn, by using the Laplace and Hankel transformations.

MSC: 76A05

keywords: Taylor-Couette flow, Oldroyd-B fluid, Maxwell fluid, second grade fluid.

1 Introduction

Oldroyd-B model provides a simple linear viscoelastic model for dilute polymer solutions, based on the dumbbell model. A wide class of fluids, such as

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